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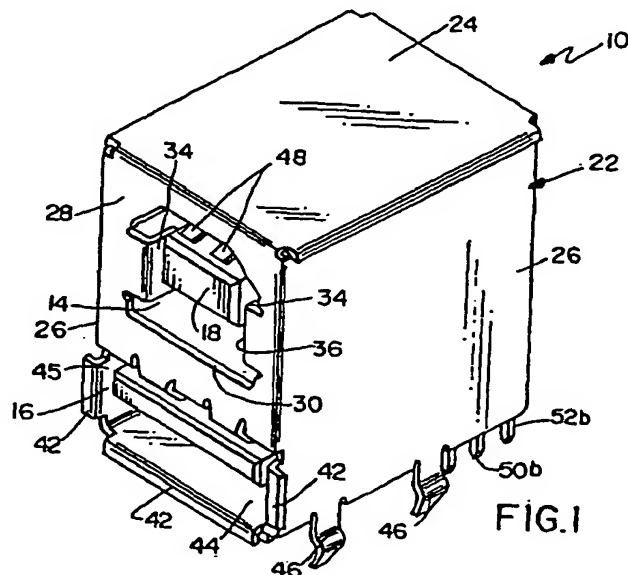
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### (54) Multi-Receptacle Electrical Connector

(57) An electrical connector (10-10C) includes a dielectric housing (12) having differently configured receptacles (14,16) and differently configured terminal supports (18,20) projecting forwardly in the receptacles. A conductive shell (22) surrounds a substantial portion of the housing (12) and includes openings (30,32) in registry with the receptacles (14,16). The shell has dif-

ferent arrays of grounding spring fingers (34,38) projecting into the receptacles from edges of the openings. A plurality of terminals are mounted on the housing, with contact portions (50,62) in different arrays on selective sides of the terminal supports (18,20).



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## Description

### Field of the Invention

[0001] This invention generally relates to the art of electrical connectors and, particularly, to a connector which has a plurality of receptacles of different configurations for receiving differently configured electrical plugs.

### Background of the Invention

[0002] In computer design, a computer mainboard mounts different interface cards for different computer peripheral apparatuses, and different connectors must be provided for connecting the different peripheral apparatus to different interface cards on the computer mainboard. There are known connectors providing specified functions. Because these connectors are independent components, they occupy considerable space on the computer mainboard. When installed, they must be separately soldered to the mainboard. Furthermore, separate assembly procedures as well as separate dismounting procedures are required for each connector.

[0003] There is a need to provide a single connector receptacle assembly which is capable of receiving multiple connectors of different configurations and different functions and solving the duplicity problems discussed above. The present invention is directed to satisfying this need and solving those problems.

### Summary of the Invention

[0004] An object, therefore, of the invention is to provide a new and improved multi-receptacle electrical connector of the character described.

[0005] In the exemplary embodiment of the invention, the electrical connector includes a dielectric housing having at least first and second receptacles for receiving appropriate complementary first and second mating connectors. A first terminal support projects forwardly in a mating direction within the first receptacle. A second terminal support projects forwardly in a mating direction within the second receptacle. A conductive shell substantially surrounds the dielectric housing and includes first and second openings in registry with the first and second receptacles, respectively, for insertion there-through of the mating connectors.

[0006] The invention contemplates that the shell include a pair of first grounding spring fingers projecting into the first receptacle from opposite edges of the first opening for engaging an appropriate shell of the first mating connector. At least one second grounding spring finger projects into the second receptacle from an edge of the second opening for engaging an appropriate shell of the second mating connector. The second grounding spring finger is pre-loaded with a distal end of the finger

seated behind a ledge of the housing within the second receptacle. A plurality of terminals are mounted on the housing, with some of the terminals having contact portions on opposite sides of the first terminal support. Other of the terminals have contact portions on only one side of the second terminal support.

[0007] As disclosed herein, the first terminal support includes opposite sides and opposite ends, with contact portions of some of the terminals on both opposite sides. The pair of first grounding spring fingers are located near both opposite ends of the first terminal support. The second grounding spring finger is located near one side of the second terminal support, with the contact portions of the other of the terminals being on an opposite side of the second terminal support. Preferably, a pair of the second grounding spring fingers are located near the one side of the second terminal support. Each of the second grounding spring fingers includes angled portions defining an apex directed inwardly toward the second terminal support.

[0008] The electrical connector is disclosed herein for mounting on a printed circuit board. The plurality of terminals have tail portions for connection to circuit traces on the printed circuit board. The conductive shell has leg portions for insertion into holes in the circuit board.

[0009] Other objects, features and advantages of the invention will be apparent from the following detailed description taken in connection with the accompanying drawings.

### Brief Description of the Drawings

[0010] The features of this invention which are believed to be novel are set forth with particularity in the appended claims. The invention, together with its objects and the advantages thereof, may be best understood by reference to the following description taken in conjunction with the accompanying drawings, in which like reference numerals identify like elements in the figures and in which:

FIGURE 1 is a perspective view of one embodiment of an electrical connector incorporating the concepts of the invention;

FIGURE 2 is a front elevational view of the connector of Figure 1;

FIGURE 3 is a vertical section taken generally along line 3-3 of Figure 2;

FIGURE 4 is a front elevational view of a second embodiment of an electrical connector according to the invention;

FIGURE 5 is a horizontal section taken generally along line 5-5 of Figure 4;

FIGURE 6 is a perspective view of a third embodiment of an electrical connector according to the invention; and

FIGURE 7 is a perspective view of a fourth embodiment of an electrical connector according to the

invention.

#### Detailed Description of the Preferred Embodiments

[0011] Referring to the drawings in greater detail, and first to Figures 1-3, a first embodiment of an electrical connector, generally designated 10, includes a dielectric housing 12 (Fig. 3) having first and second receptacles 14 and 16, respectively, for receiving appropriate complementary first and second mating connectors (not shown). The housing includes a first terminal support 18 projecting forwardly in a mating direction generally centrally within first receptacle 14. As can be seen in Figures 2 and 3, terminal support 18 is elongated to define opposite sides and opposite ends. A second terminal support 20 projects forwardly in a mating direction generally centrally within second receptacle 16. Like terminal support 18, terminal support 20 is elongated to define opposite sides and opposite ends.

[0012] Electrical connector 10 includes a generally box-shaped conductive shell, generally designated 22, which substantially surrounds dielectric housing 12. The shell may be stamped and formed of sheet metal material and include a top wall 24, opposite side walls 26 and a front wall 28. The shell includes first and second openings 30 and 32, respectively, in registry with first and second receptacles 14 and 16, respectively, of housing 12 for insertion therethrough of the mating connectors. The lateral edges of the first opening 30 are parallel to each other and orthogonal to the lower edge. Three upper edges of the first opening are angularly disposed to comprise half of a hexagon. The shell includes a pair of first grounding spring fingers 34 projecting from front wall 28 into first receptacle 14 from opposite edges 36 of first opening 30 for engaging an appropriate shell of the first mating connector. As best seen in Figure 2, a pair of second grounding fingers 38 project from front wall 28 of the shell at a top edge of second opening 32 and into second receptacle 16 for engaging an appropriate shell of the second mating connector. Each second grounding spring finger 38 has an inner distal end 38a seated behind a ledge 40 of the housing within second receptacle 16 for pre-loading the spring fingers. Each second grounding spring finger 38 also has angled portions defining an apex 38b facing downwardly or inwardly toward second terminal support 20 of the housing. Three flanges 42 are flared outwardly from the three edges of opening 32 remote from the edge from which second grounding spring fingers 38 project.

[0013] As best seen in Figure 3, the shell has a substantial bottom plate 44 and side plates 45 (Fig. 1) which project inwardly into second receptacle 16 of the housing to define the transverse bottom wall and parallel side walls of the receptacle. Finally, the shell includes a plurality of leg portions 46 for insertion into appropriate holes in a printed circuit board to solder-connect the shell to grounding traces on the board and/or in the

holes. It can be seen that the legs are offset and angled to provide a press-fit in the board holes to facilitate holding the connector to the board during a soldering process.

[0014] Generally, a plurality of terminals 48, 50, 52 are mounted on housing 12 and include respective tail portions 48b, 50b, 52b, for insertion into appropriate holes in the printed circuit board to solder-connect the terminals to circuit traces on the board and/or in the holes. The terminals 48, 50 in the first receptacle 14 have contact portions 48a, 50a supported in grooves on both opposite sides of first terminal support 18 within first receptacle 14 of the housing. First grounding spring fingers 34 are located near both opposite ends of the terminal support 18.

[0015] The terminals 52 have contact portions 52a supported in grooves located on only one side of second terminal support 20 within second receptacle 16 of the housing. It can be seen that second grounding spring fingers 38 are located at one side of the terminal support and contact portions 52a are located at an opposite side of the terminal support.

[0016] Figures 4 and 5 show a second embodiment of an electrical connector, generally designated 10A, according to the invention. It can be seen that the basic configurations of the two receptacles 14 and 16, as well as the associated shell portions and contact portions have the same configurations as shown in the embodiment of Figures 1-3 and described above. Consequently, like reference numerals have been applied in Figures 4 and 5 corresponding to like components described above in relation to Figures 1-3.

[0017] The difference between connector 10A (Figs. 4 and 5) and connector 10 (Figs. 1-3) is that receptacles 14 and 16 have been reoriented in Figures 4 and 5 so that elongated terminal supports 18 and 20 extend generally in relative perpendicular directions versus the parallel directions of connector 10 in Figures 1-3. The terminals 48, 50, 52 are configured so that tail portions 48b and 50b do not laterally overlap with tail portions 52b. Tail portions 52b now project from a side of receptacle 16 of connector 10A in comparison to the bottom of receptacle 16 of connector 10. Leg portions 46 of the shell also have been relocated.

[0018] Figure 6 shows a third embodiment of an electrical connector, generally designated 10B, according to the invention. Again, like reference numerals are applied in Figure 6 corresponding to like components described above in relation to the embodiments of Figures 1-5. Connector 10B in Figure 6 has a configuration substantially identical to that of connector 10A (Figs. 4 and 5), except that receptacle 16 has been located in connector 10B to the left of receptacle 14, versus receptacle 16 of connector 10A being located at the right of receptacle 14.

[0019] Figure 7 shows a fourth embodiment of an electrical connector, generally designated 10C. Again, like reference numerals have been applied in Figure 7

corresponding to like components described above in relation to the embodiments of Figures 1-6. Connector 10C is substantially identical to connector 10 (Figs. 1-3) except that receptacle 16 of connector 10C is wider than receptacle 16 of connector 10. The enlarged receptacle 16 in connector 10C is provided for accommodating an enlarged or elongated second mating connector.

[0020] It will be understood that the invention may be embodied in other specific forms without departing from the spirit or central characteristics thereof. The present examples and embodiments, therefore, are to be considered in all respects as illustrative and not restrictive, and the invention is not to be limited to the details given herein.

#### Claims

1. An electrical connector (10-10C), comprising:

a dielectric housing (12) having at least first (14) and second (16) receptacles for receiving appropriate complementary first and second mating connectors, a first terminal support (18) projecting forwardly in a mating direction within the first receptacle (14), and a second terminal support (20) projecting forwardly in mating direction within the second receptacle (16); a conductive shell (22) substantially surrounding the dielectric housing (12) and including first (30) and second (32) openings in registry with the first and second receptacles, respectively, for insertion therethrough of the mating connectors, the shell including a pair of first grounding spring fingers (34) projecting into the first receptacle (14) from opposite edges of said first opening (30) for engaging an appropriate shell of the first mating connector, and at least one second grounding spring finger (38) projecting into the second receptacle (16) from an edge of said second opening (32) for engaging an appropriate shell of the second mating connector, the second grounding spring finger (38) being pre-loaded with a distal end (38a) of the finger seated behind a ledge (40) of the housing; and a plurality of terminals mounted on the housing, some of the terminals having contact portions (50) on opposite sides of the first terminal support (18), and other of the terminals having contact portions (52) on only one side of the second terminal support (20).

2. The electrical connector of claim 1 wherein said first terminal support (18) includes opposite sides and opposite ends, said some of the terminals having contact portions (50) on both opposite sides and said pair of first grounding spring fingers (34)

being located near both opposite ends of the first terminal support (18).

3. The electrical connector of claim 1 wherein said second grounding spring finger (38) is located near one side of the second terminal support (20) and said other of the terminals have contact portions (52) on an opposite side of the second terminal support (20).
4. The electrical connector of claim 3, including a pair of said second grounding spring fingers (38) located near said one side of the second terminal support (20).
5. The electrical connector of claim 1 wherein said plurality of terminals have tail portions (48) for connection to circuit traces of an appropriate printed circuit board.
6. The electrical connector of claim 1 wherein said conductive shell (22) has leg portions (46) for insertion into holes in an appropriate printed circuit board.
7. The electrical connector of claim 6 wherein said plurality of terminals have tail portions (48) for connection to circuit traces of an appropriate printed circuit board.
8. The electrical connector of claim 1 wherein said conductive shell (22) includes flanges (42) flared outwardly from edges of the second opening (32) remote from said edge from which the second grounding spring finger (38) projects.
9. The electrical connector of claim 1 wherein said second grounding spring finger (38) includes angled portions defining an apex (38b) directed inwardly toward the second terminal support (20).
10. An electrical connector (10-10C), comprising:

a dielectric housing (12) having at least first (18) and second (20) terminal supports spaced from each other and projecting forwardly in a mating direction; a conductive shell (22) about a substantial portion of the dielectric housing (12) and including first (30) and second (32) openings in registry with the first and second terminal supports, respectively, for insertion therethrough of appropriate complementary first and second mating connectors, the shell including a pair of first grounding spring fingers (34) projecting inwardly from opposite edges of said first opening (30) for engaging an appropriate shell of the first mating connector, and at least one second

grounding spring finger (38) projecting inwardly from an edge of said second opening (32) for engaging an appropriate shell of the second mating connector; and

a plurality of terminals mounted on the housing (12), some of the terminals having contact portions (50) on opposite sides of the first terminal support (18), and other of the terminals having contact portions (52) on only one side of the second terminal support (20). 5 10

11. The electrical connector of claim 10 wherein said first terminal support (18) includes opposite sides and opposite ends, said some of the terminals having contact portions (50) on both opposite sides and said pair of first grounding spring fingers (34) being located near both opposite ends of the first terminal support (18). 15

12. The electrical connector of claim 10 wherein said second grounding spring finger (38) is located near one side of the second terminal support (20) and said other of the terminals have contact portions (52) on an opposite side of the second terminal support (20). 20 25

13. The electrical connector of claim 12, including a pair of said second grounding spring fingers (38) located near said one side of the second terminal support (20). 30

14. The electrical connector of claim 10 wherein said plurality of terminals have tail portions (48) for connection to circuit traces of an appropriate printed circuit board. 35

15. The electrical connector of claim 10 wherein said conductive shell (22) has leg portions (46) for insertion into holes in an appropriate printed circuit board. 40

16. The electrical connector of claim 15 wherein said plurality of terminals have tail portions (48) for connection to circuit traces of an appropriate printed circuit board. 45

17. The electrical connector of claim 10 wherein said conductive shell (22) includes flanges (42) flared outwardly from edges of the second opening (32) remote from said edge from which the second grounding spring finger (38) projects. 50

18. The electrical connector of claim 10 wherein said second grounding spring finger (38) includes angled portions defining an apex (38b) directed inwardly toward the second terminal support (20). 55

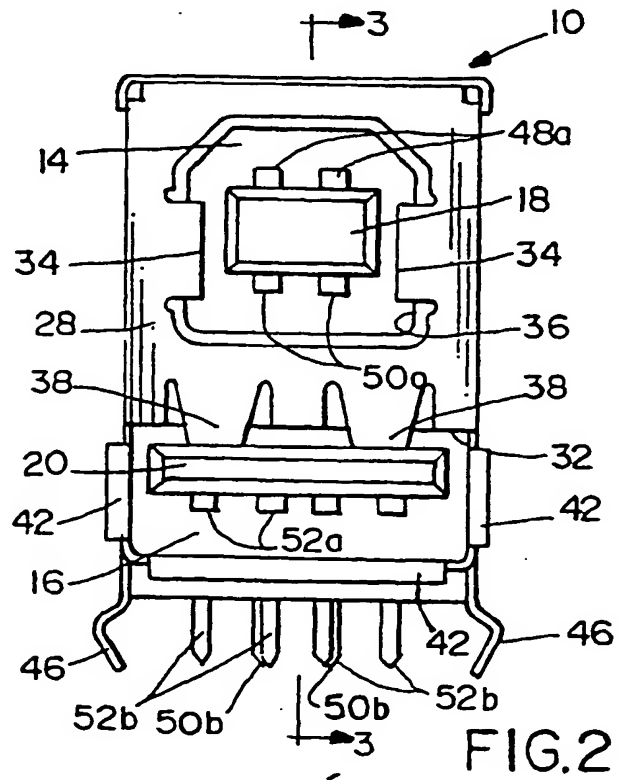
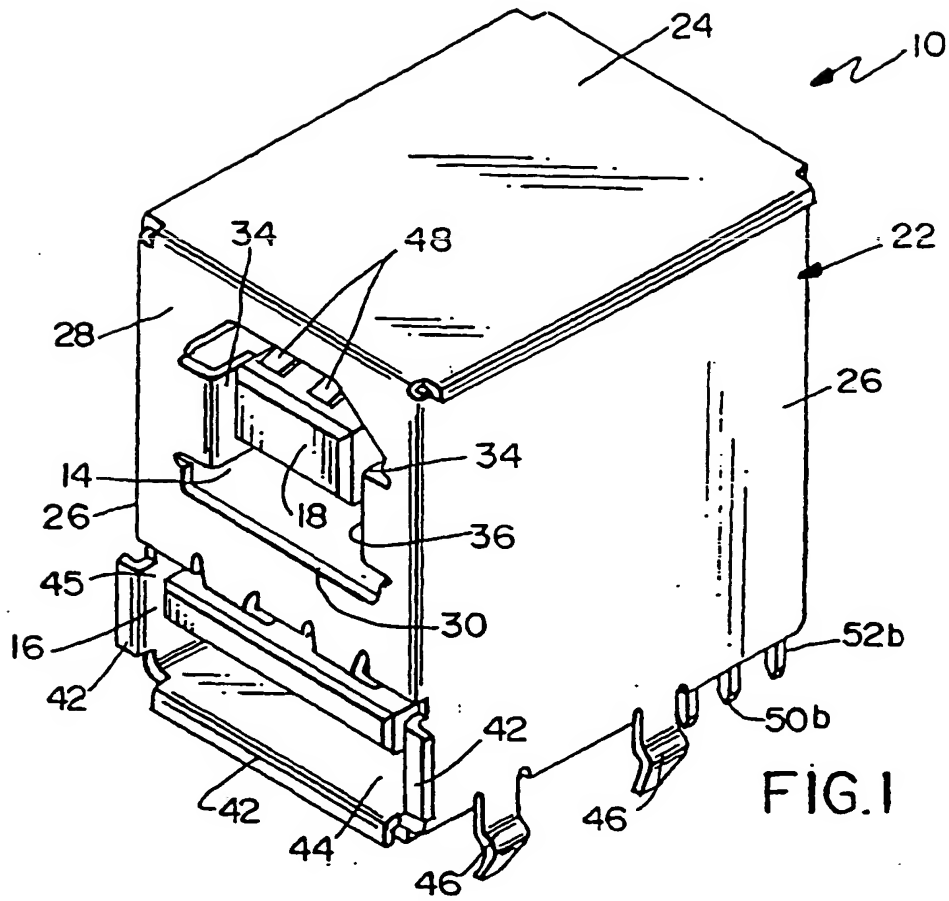
19. An electrical connector (10-10C), comprising:

a dielectric housing (12) having a first terminal support (18) projecting forwardly in a mating direction, the first terminal support being elongated in cross-section defining opposite sides and opposite ends, a second terminal support (20) projecting forwardly in said mating direction, and the second terminal support being elongated in cross-section defining opposite sides and opposite ends;

a plurality of terminals mounted on the housing, some of the terminals having contact portions (50) on said opposite sides of the first terminal support (18), and other of the terminals having contact portions (52) on only one side of the second terminal support (20); and a conductive shell (22) about a substantial portion of the dielectric housing (12) and including first (30) and second (32) openings in registry with the first (18) and second (20) terminal supports, respectively, the shell including a first grounding finger (34) projecting inwardly near the first terminal (18) support from an edge of said first opening (30), and a second grounding finger (38) projecting inwardly near the second terminal support (20) from an edge of said second opening (32).

20. The electrical connector of claim 19 wherein said second grounding finger (38) is located on the other side of the second terminal support (20) opposite the contact portions (52) of said other of the terminals.

21. The electrical connector of claim 19, including a pair of said first grounding fingers (34) located near said opposite ends of the first terminal support (18).



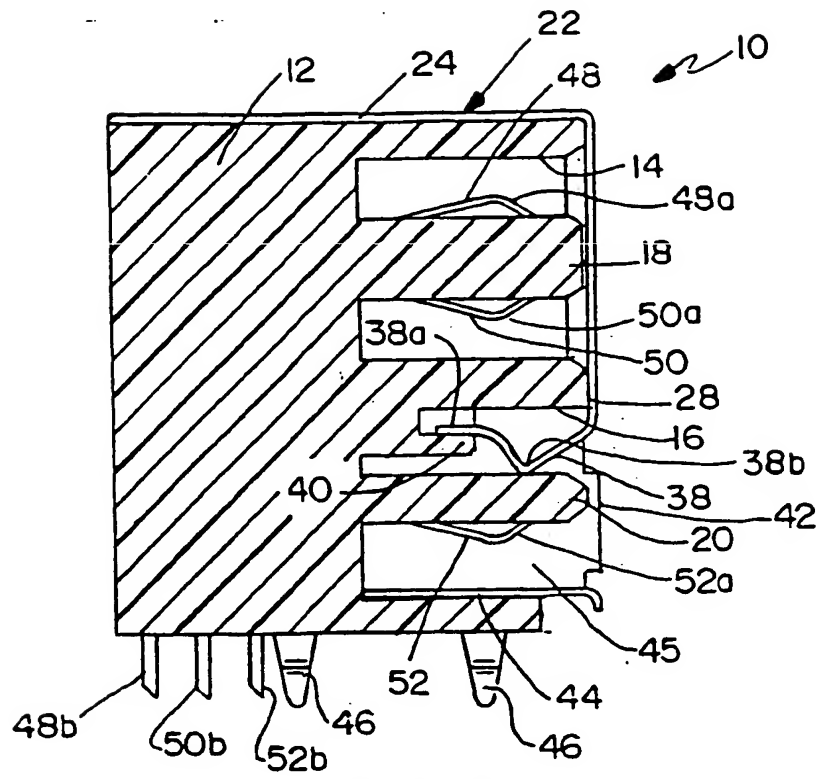


FIG.3

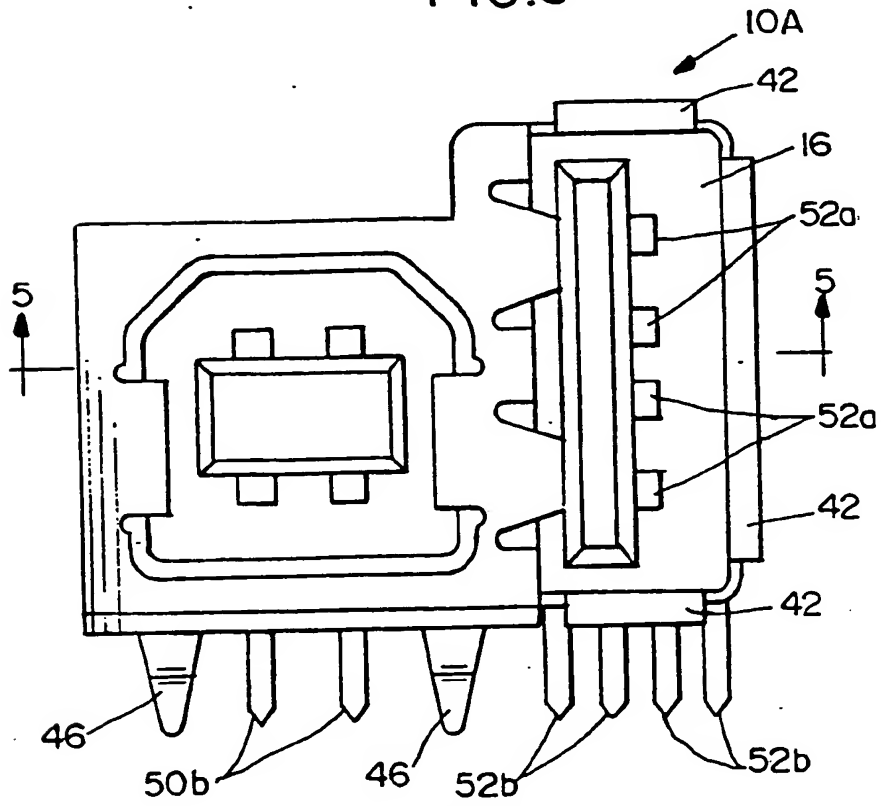


FIG.4

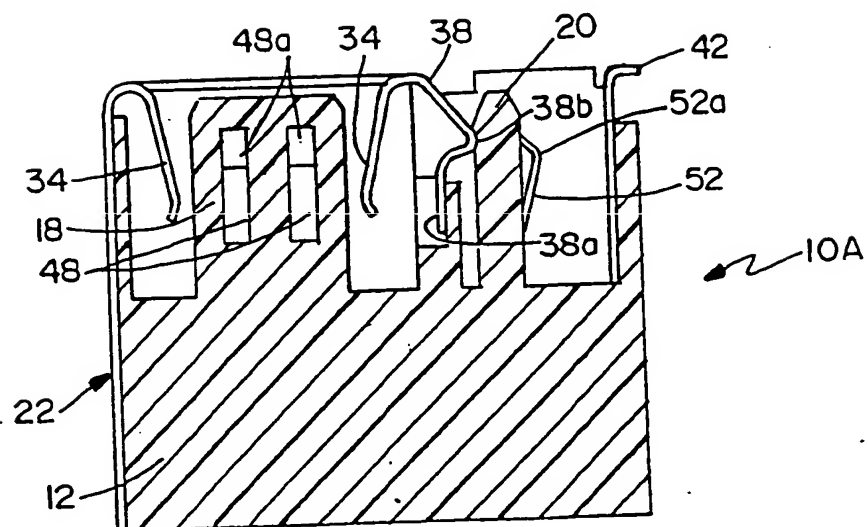


FIG.5

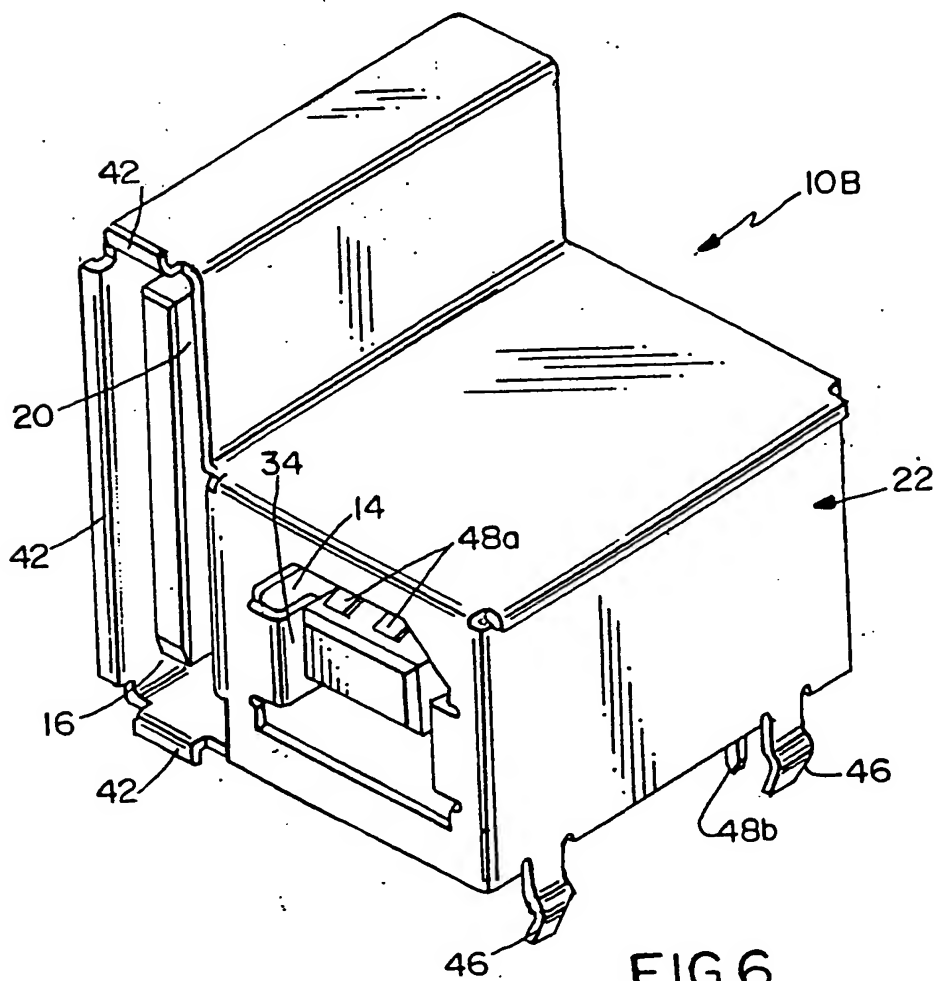


FIG.6

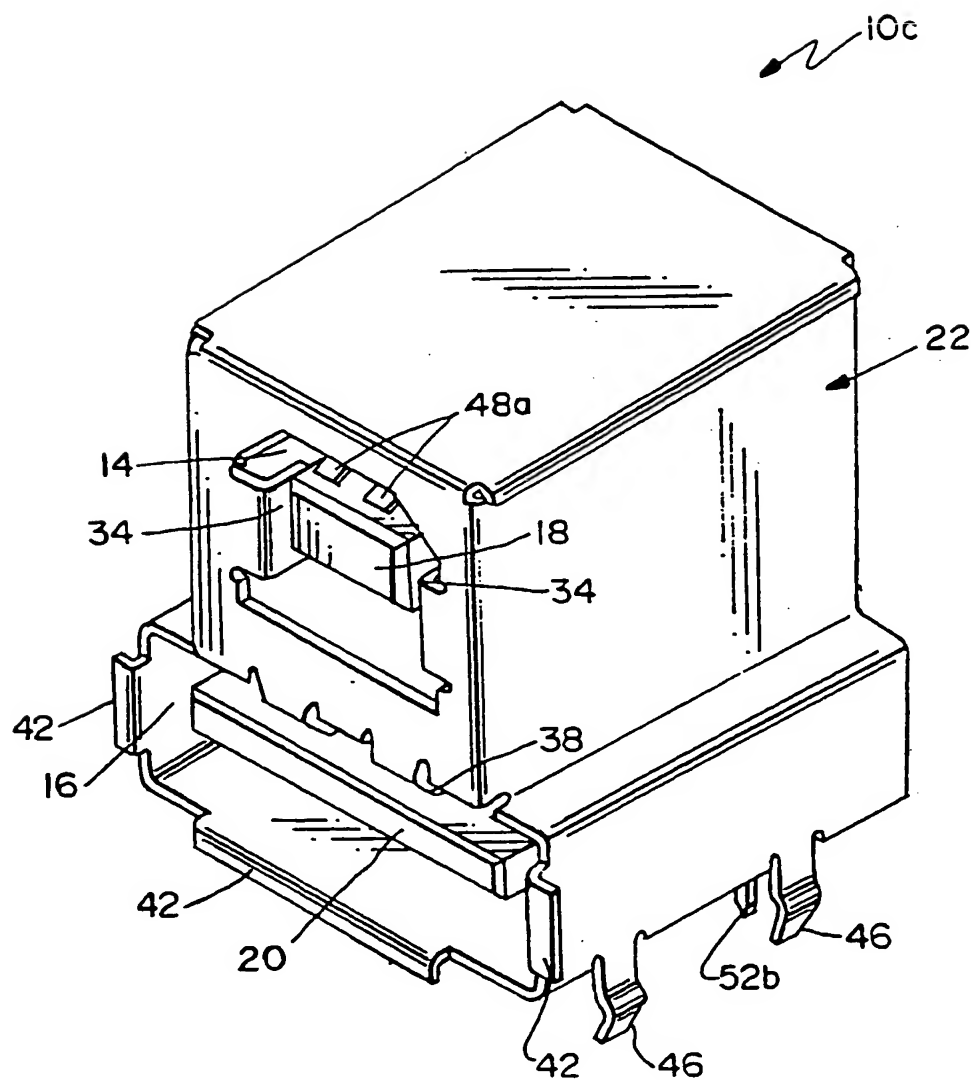


FIG.7



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## EUROPEAN SEARCH REPORT

Application Number  
EP 98 10 5033

| DOCUMENTS CONSIDERED TO BE RELEVANT   |  |  |  |
|---|--|--|--|
| Category  | Citation of document with indication, where appropriate, of relevant passages  | Relevant to claim                                  | CLASSIFICATION OF THE APPLICATION (Int.Cl.6) |
| A   | EP 0 739 062 A (AMPHENOL) 23 October 1996<br>* column 3, line 47 - line 58 *<br>* column 6, line 13 - line 54; figures 2-6 *           | 1,10,19  | H01R3/00<br>H01R27/02<br>H01R23/02           |
| A   | US 5 702 271 A (J.R.STEINMANN) 30 December 1997<br><br>* column 2, line 31 - line 47 *<br>* column 3, line 16 - line 23; figures 3,4 * | 1,2,5-8,<br>10,11,<br>14-17,<br>19,21              |  |
| A   | US 5 221 212 A (W.S.DAVIS) 22 June 1993<br><br>* column 4, line 11 - line 29; figure 7 *   | 1,5-7,<br>10,<br>14-16,19                          |  |
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|   |  |  | H01R   |
| The present search report has been drawn up for all claims  |  |  |  |
| Place of search<br>BERLIN   |  | Date of completion of the search<br>26 August 1998 | Examiner<br>Alexatos, G                      |
| <p>CATEGORY OF CITED DOCUMENTS</p> <p>X : particularly relevant if taken alone<br/>Y : particularly relevant if combined with another document of the same category<br/>A : technological background<br/>O : non-written disclosure<br/>P : intermediate document</p> <p>T : theory or principle underlying the invention<br/>E : earlier patent document, but published on, or after the filing date<br/>O : document cited in the application<br/>L : document cited for other reasons<br/>A : member of the same patent family, corresponding document</p> |  |  |  |

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EP 98 10 5033

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26-08-1998

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